

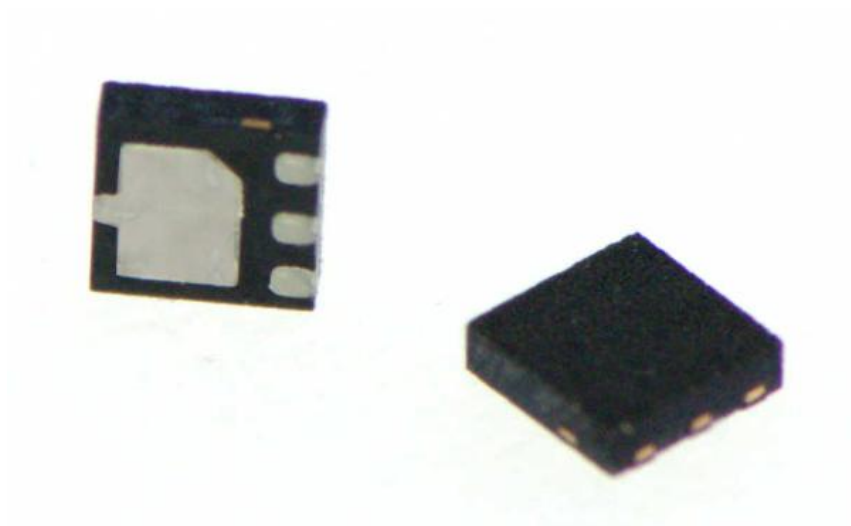
Product Data Sheet

TMR magnetic sensor chip

Product Series: FFA-xxxHD16L5VT2

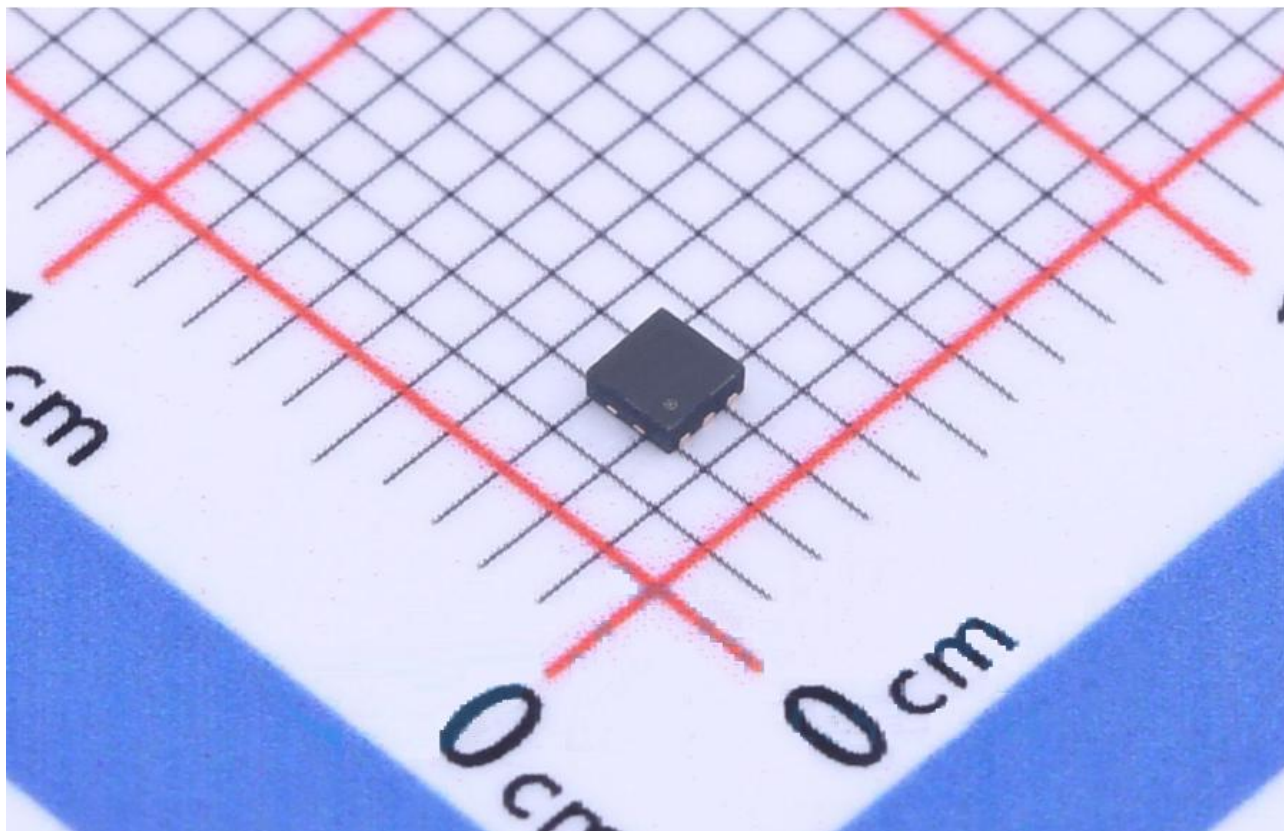
Part Number: FFA-020HD16L5VT2-020K
FFA-020HD16L5VT2-200K

Version: Ver 1.5



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1. Key Features

- TMR Technology
- Wide Power Supply Range
- Low Hysteresis
- Fast Frequency Response

2. Application

- Magnetic Field Sensor
- Magnet position detection
- Current detection
- Key board

3. Description

The FFA-xxxHD16L5VT2 is a high sensitive TMR sensor. It contains one half bridge with two unshielded TMR elements. The output of FFA-xxxHD16L5VT2 is proportional to the applied magnetic field that is parallel to the sensing direction of sensor. The FFA-xxxHD16L5VT2 is provided in a DFN1616H055-4L package.

The FFA-xxxHD16L5VT2 is a magnetic field sensor. Any source which can generate a magnetic field could drive this sensor to work. With a matching magnetic path design, the sensor will has the best performance to detect current, magnetic field, angular, position, etc.

4. Operating Characteristics

V_{CC} = 3.3 V, T_A = 25 deg.C, Otherwise Specified

Parameter		Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage		V _{CC}		1	3.3	5.5	V
Supply Current @ 3.3 V	FFA-020HD16L5VT2-020K	I _{DD}			165		μA
	FFA-020HD16L5VT2-200K	I _{DD}			16.5		μA
Offset		V _{OFF}	H = 0 Gs	-20	0	20	mV/V
Offset Temperature Coefficient		TCO	H = 0 Gs		0.015		mV/V/°C
Range of working Field		H _{WORK}		-160		160	Gs
Linearity Error		£L	Fit ±50%*H _{WORK}		5		%
Half bridge resistance	FFA-020HD16L5VT2-020K	R			20		kOhm
	FFA-020HD16L5VT2-200K	R			200		kOhm
Sensitivity @ ±25 Gs		SEN			2.0		mV/V/Gs
Sensitivity Temperature Coefficient		TCS			1500		PPM/°C
Frequency Response	FFA-020HD16L5VT2-020K	f			500		kHz
	FFA-020HD16L5VT2-200K	f			50		kHz

Note: working field range is defined as when the sensitivity dropped to the 20% of SEN (@±25 Gs).

5. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Power Supply	V_{CC}	—	6	V
ESD (HBM)	V_{ESD}	—	4	KV
Storage Temperature	Tstg	-50	150	°C
Operation Temperature	TA	-40	125	°C
Range of working Field	H_{WORK}	-160	160	Gs

Note: When the operating conditions of the product exceed the limit parameters, it may cause irreparable damage to the product. Working at the limit parameters for a long time may lead to a decline in product performance and product reliability.

6. Transfer Curve

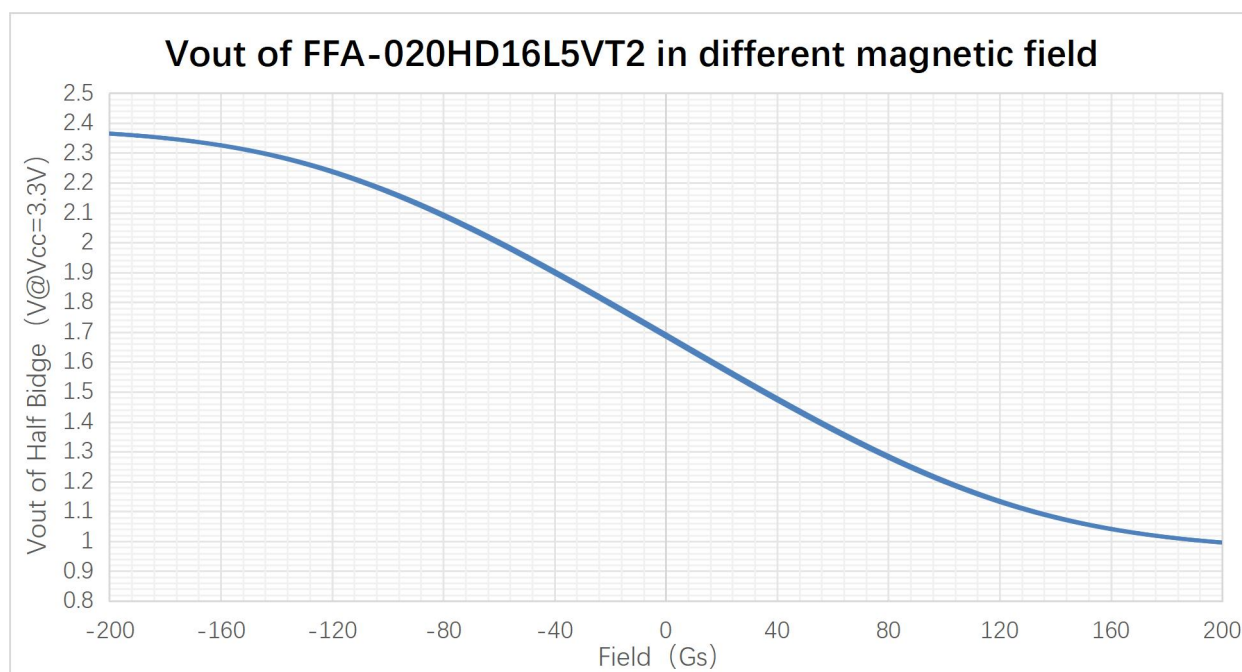


Fig.1 the output of FFA-020HD16L5VT2 series magnetic sensors with $V_{CC} = 3.3\text{ V}$.

7. Power-on response time

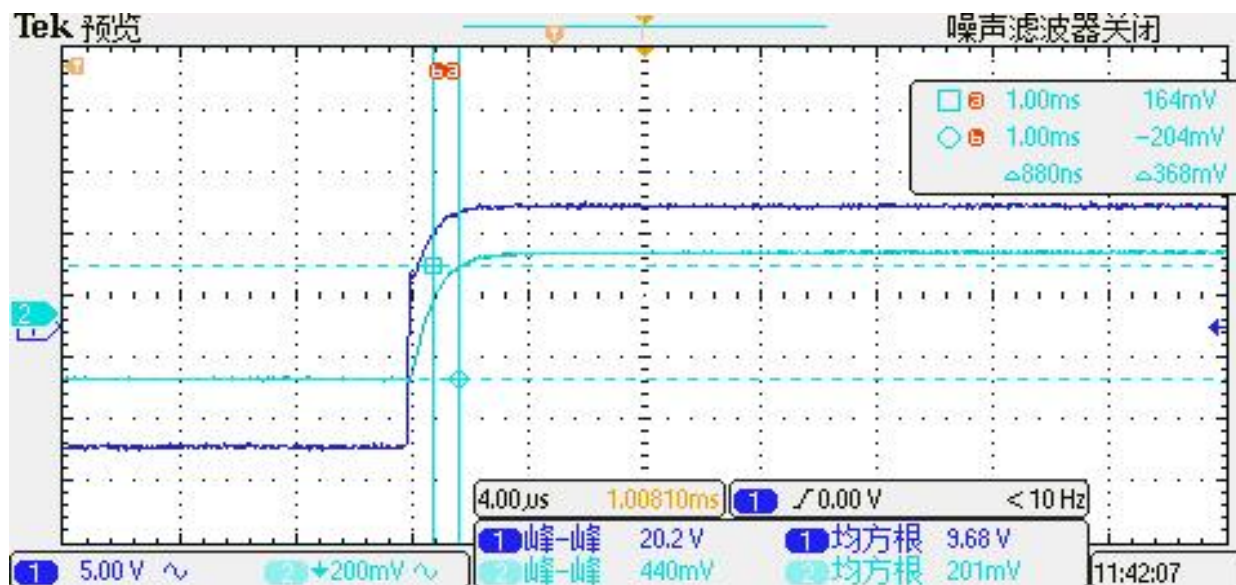


Fig.2 CH1 is Vcc voltage, and CH2 is output voltage; FFA-020HD16L5VT2-020K series show Power-on response time of 880 ns ($\sim 1.0 \mu\text{s}$)

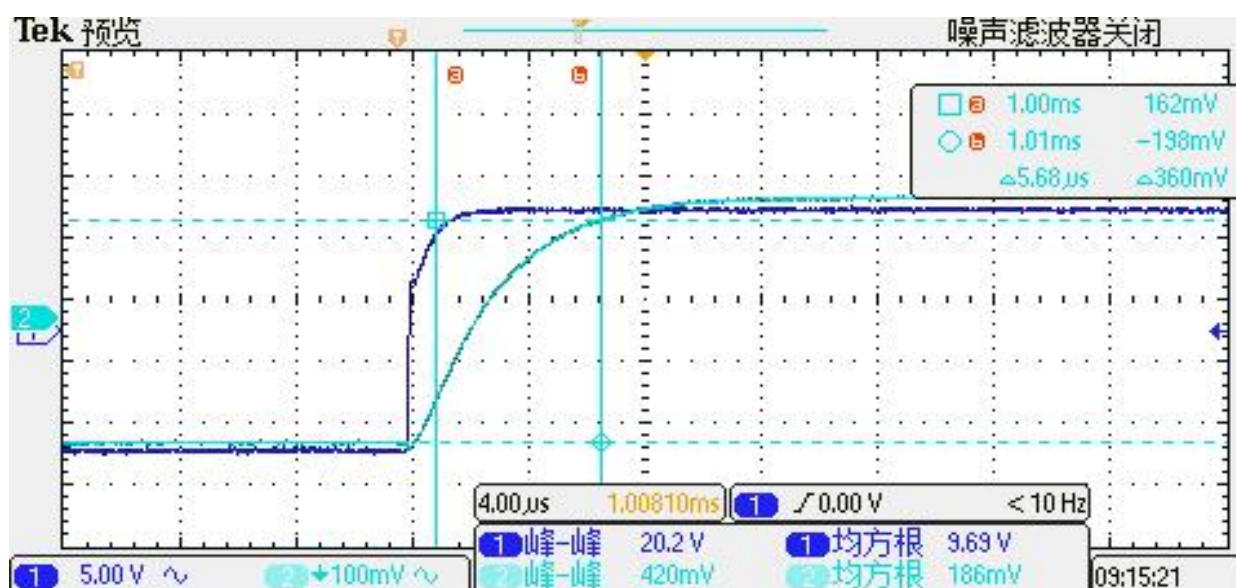


Fig.3 CH1 is Vcc voltage, and CH2 is output voltage; FFA-020HD16L5VT2-200K series show Power-on response time of 5.68 μs ($\sim 6 \mu\text{s}$)

8. Output bandwidth

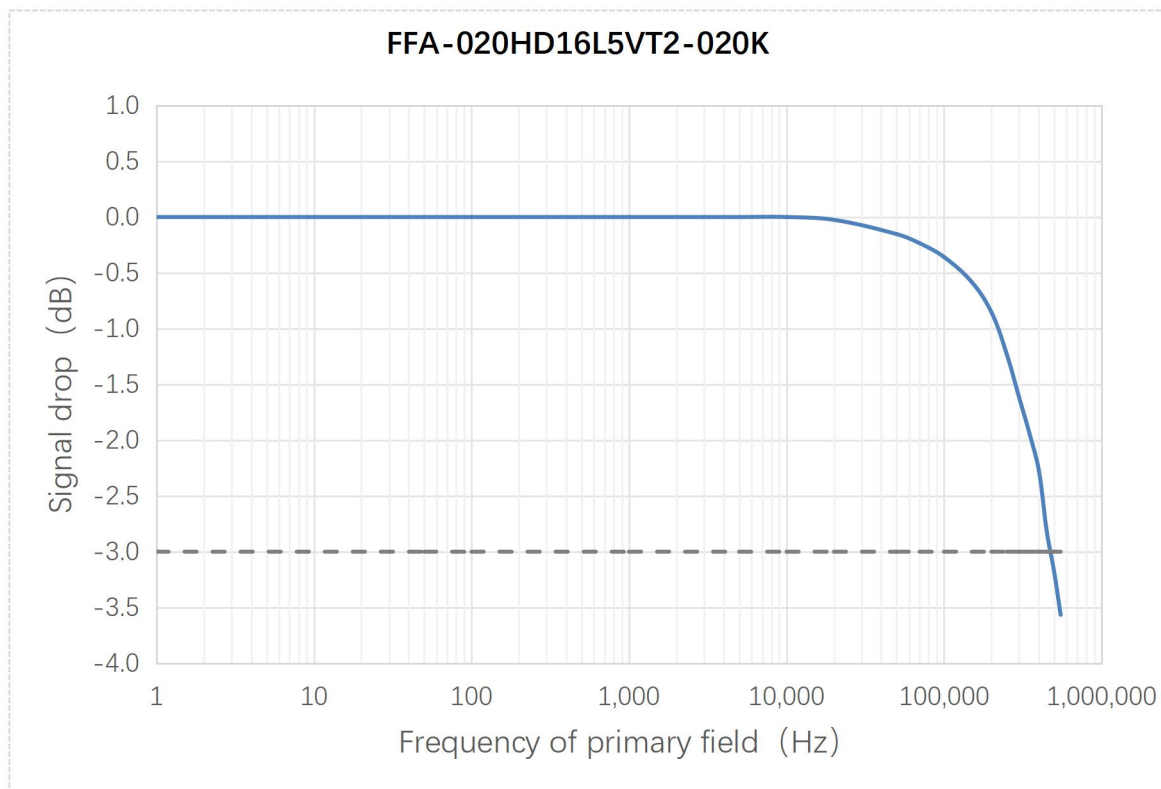


Fig.4 FFA-020HD16L5VT2-020K series show Output bandwidth ~500 kHz (-3 dB)

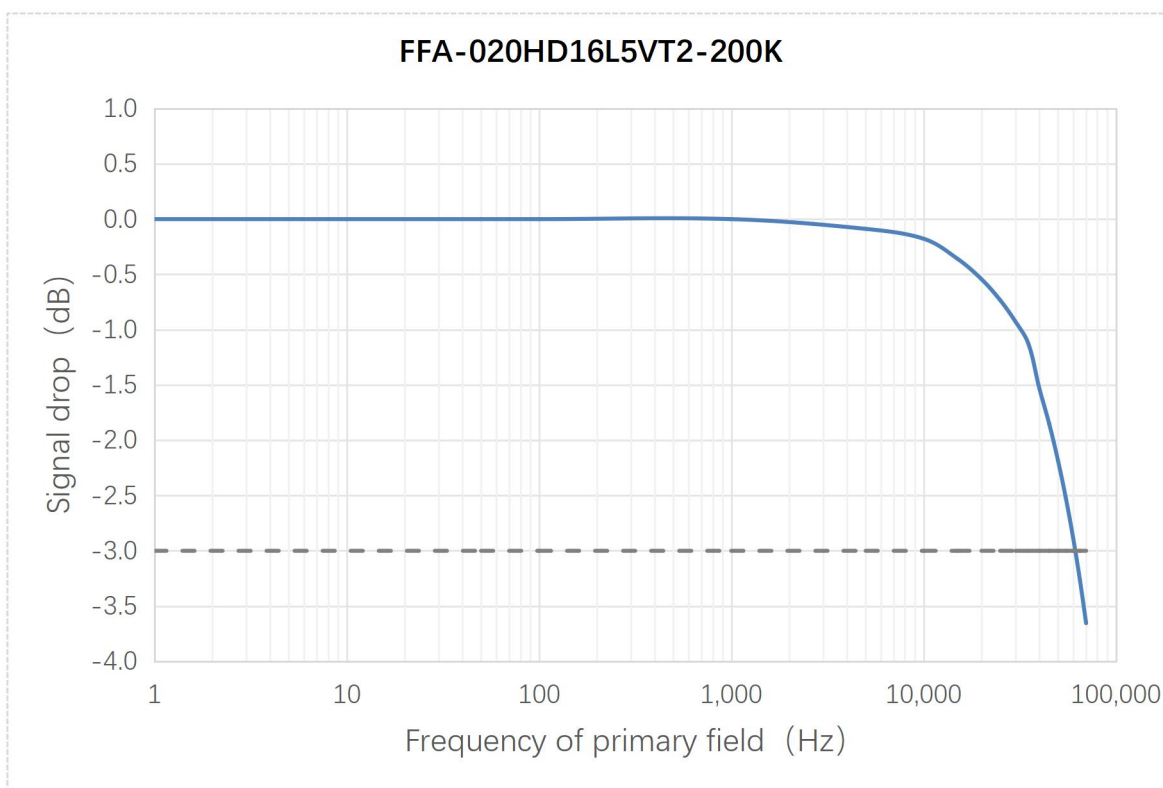


Fig.5 FFA-020HD16L5VT2-200K series show Output bandwidth ~60 kHz (-3 dB)

9. Typical output response time

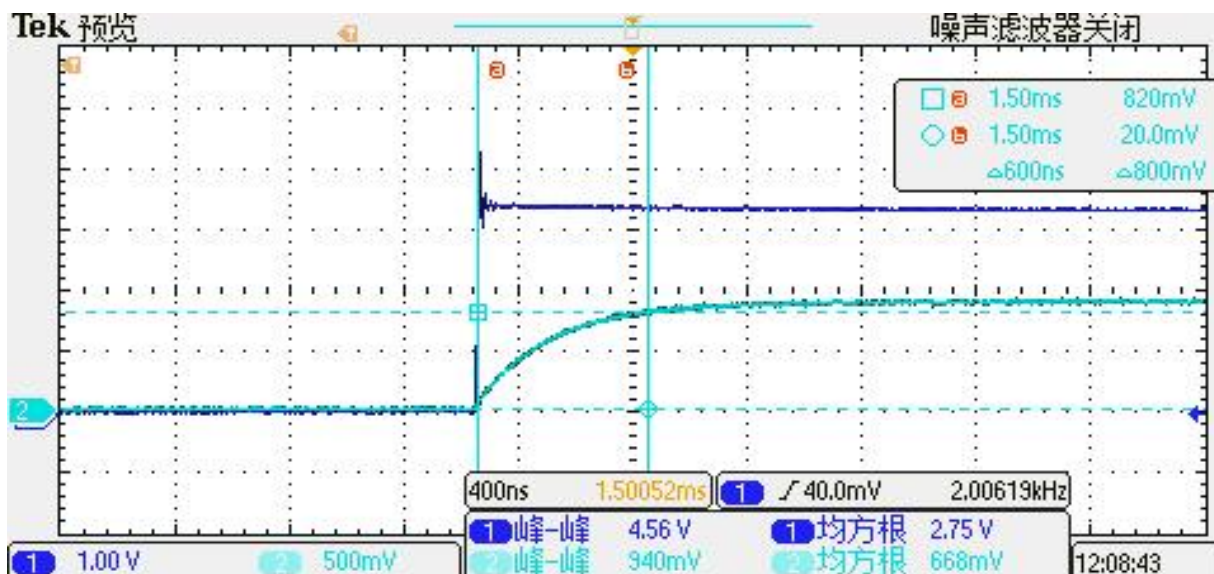


Fig.6 CH1 is primary magnetic field, and CH2 is output voltage; FFA-020HD16L5VT2-020K series show output response time of 600 ns ($< 1 \mu\text{s}$)

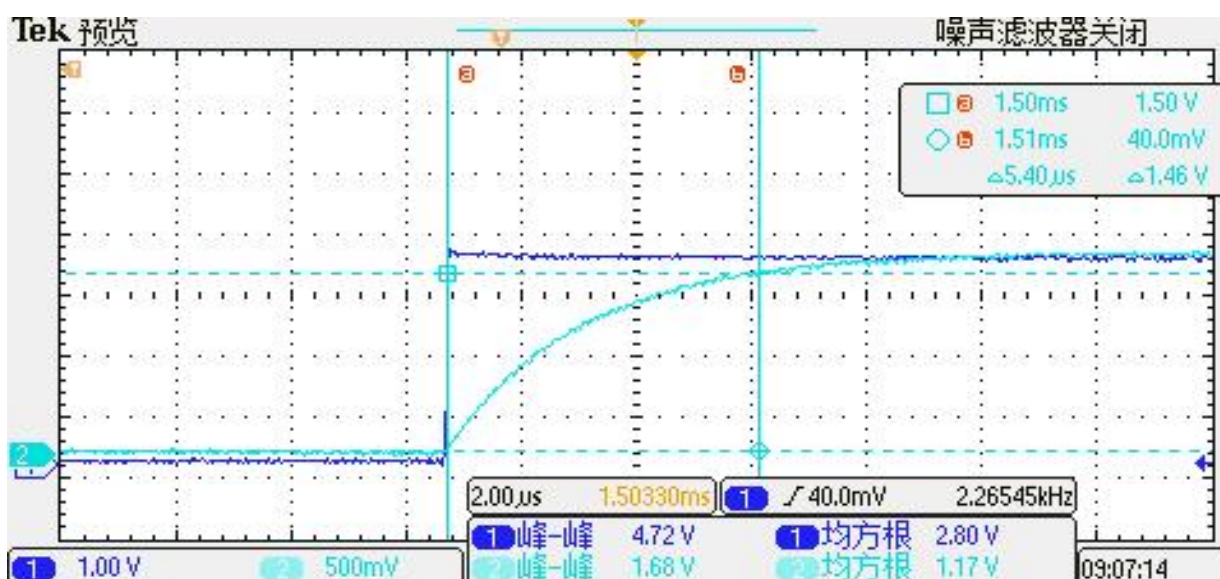


Fig.7 CH1 is primary magnetic field, and CH2 is output voltage; FFA-020HD16L5VT2-200K series show output response time of 5.4 μs ($< 10 \mu\text{s}$)

10. Functional Diagram and Sensing Direction

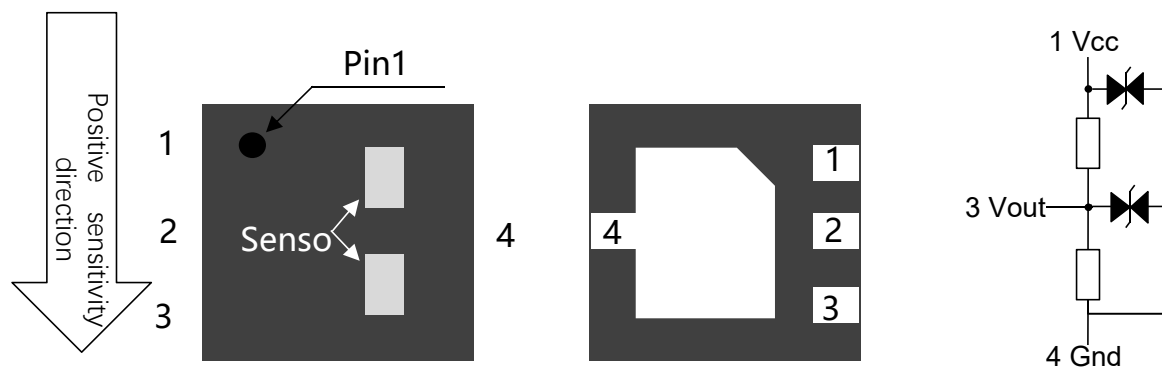


Fig.8 the functional diagram of the sensors, and the definition on the positive sensing direction, along this direction, the output voltage of the sensor increased with the increasing magnetic field.

Table.1 the pin definition of the packaged chips.

PIN	Symbol	Description
1	Vcc	Vcc of Power supply
2	NC	No Connection
3	Vout	Output
4	Gnd	GND of power supply

11. Package Dimension & Sensing Area

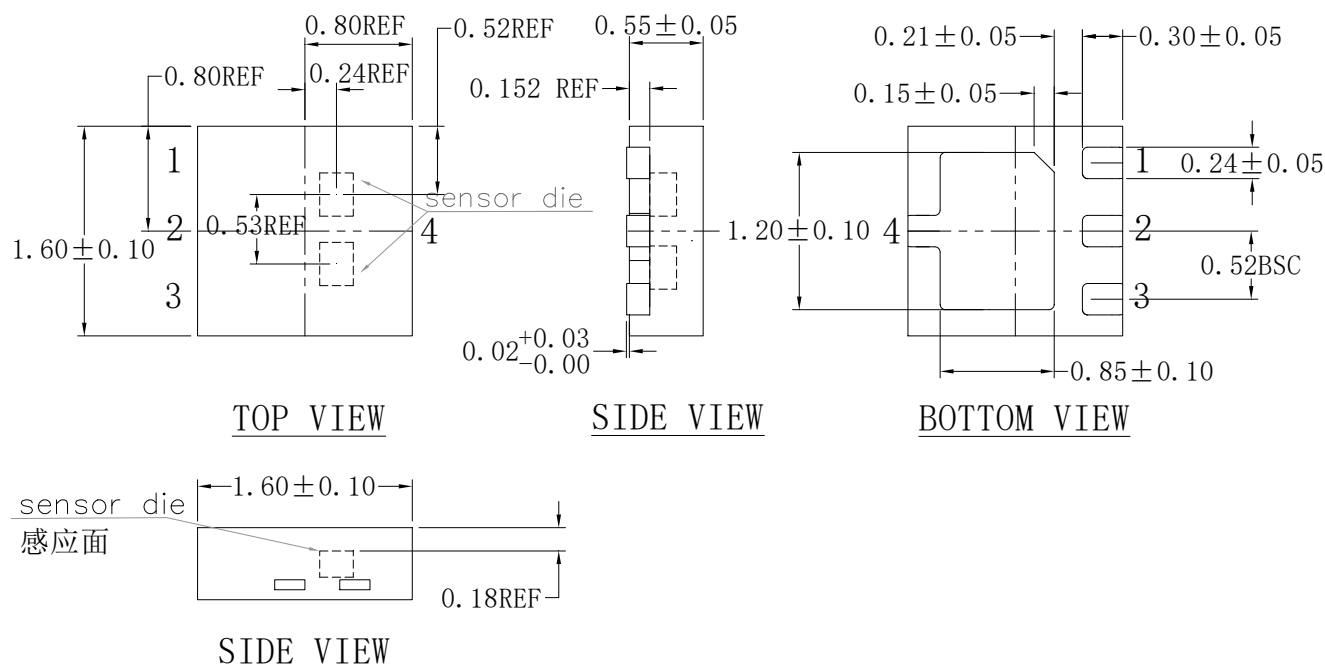


Fig.9 the dimensions of the packaged chips, and the position of sensing area(unit: mm).

12. Footprint on PCB

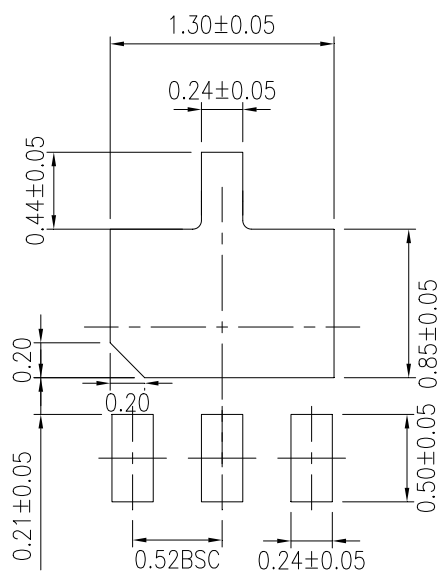


Fig.10 footprint of the sensor chips with DFN1616H055-4L package(unit: mm)..

13. Application suggestion for small magnet position detection

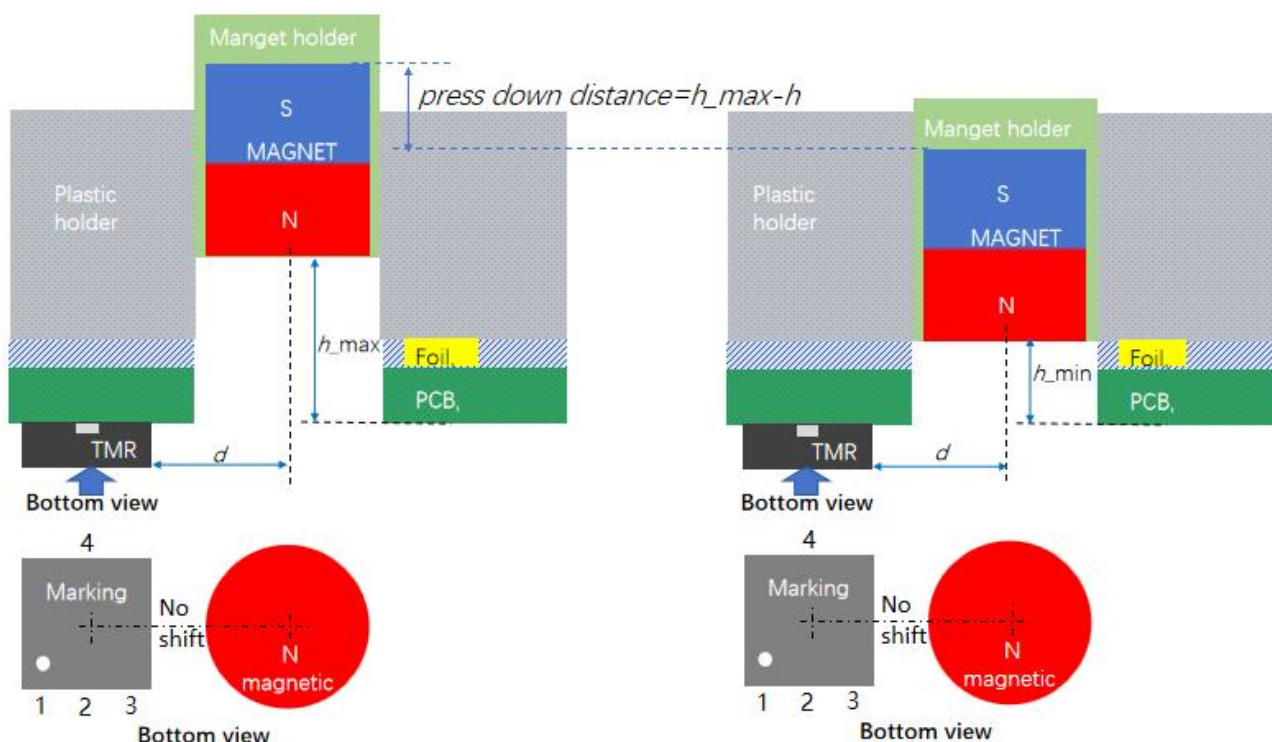
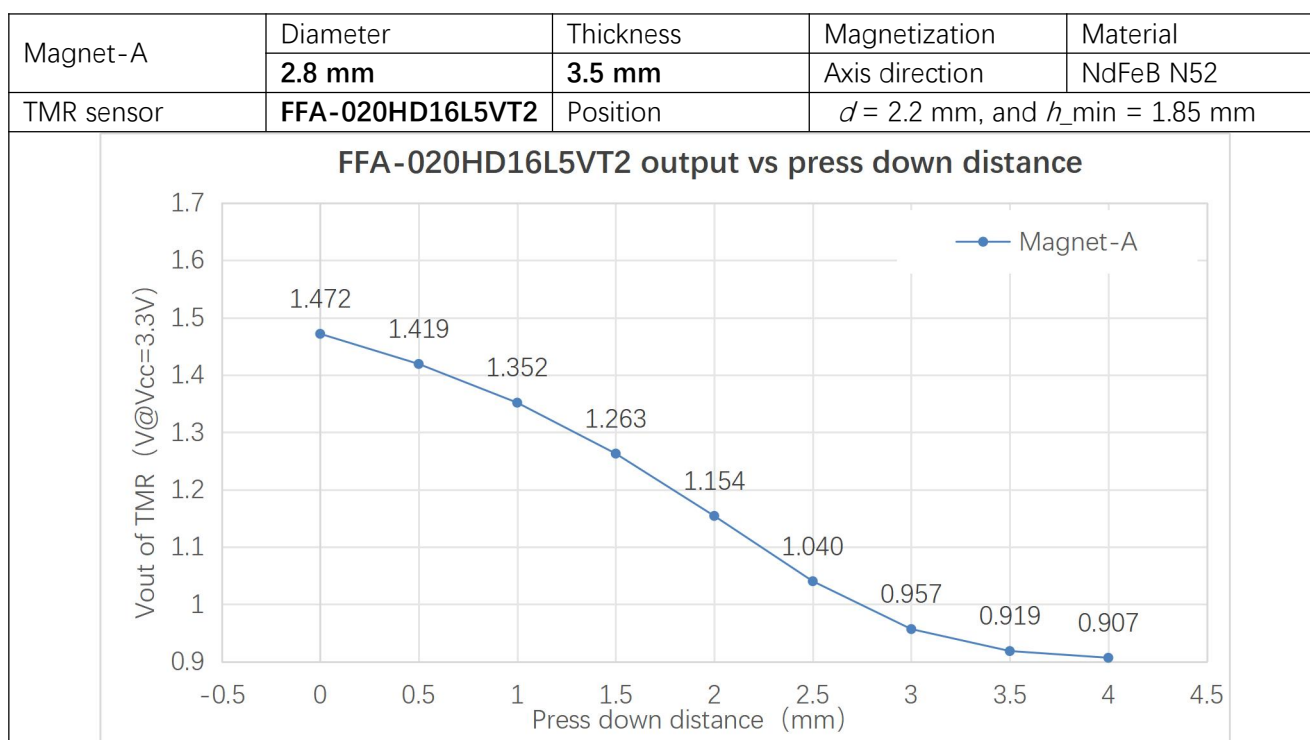


Fig.11 suggested configuration when detecting moving position of small magnet. When the magnet is pressed down, the value of h decreased. $(h_{\max} - h)$ is defined as “**Press down distance**”.

The figure describes the relative position of the magnet and the sensor. The cylinder magnet is magnetized along axis direction. The distance from the axis of the magnet to the edge of the sensor chip is defined as “ d ”. The distance from bottom of magnet to the bottom of the PCB is defined as “ h ”.

☆ For application magnets, the following is a typical N-type magnetic potential downward application example, if it is other magnetic pole direction application, please contact us, need to adjust the chip on the PCB board and magnet relative position.



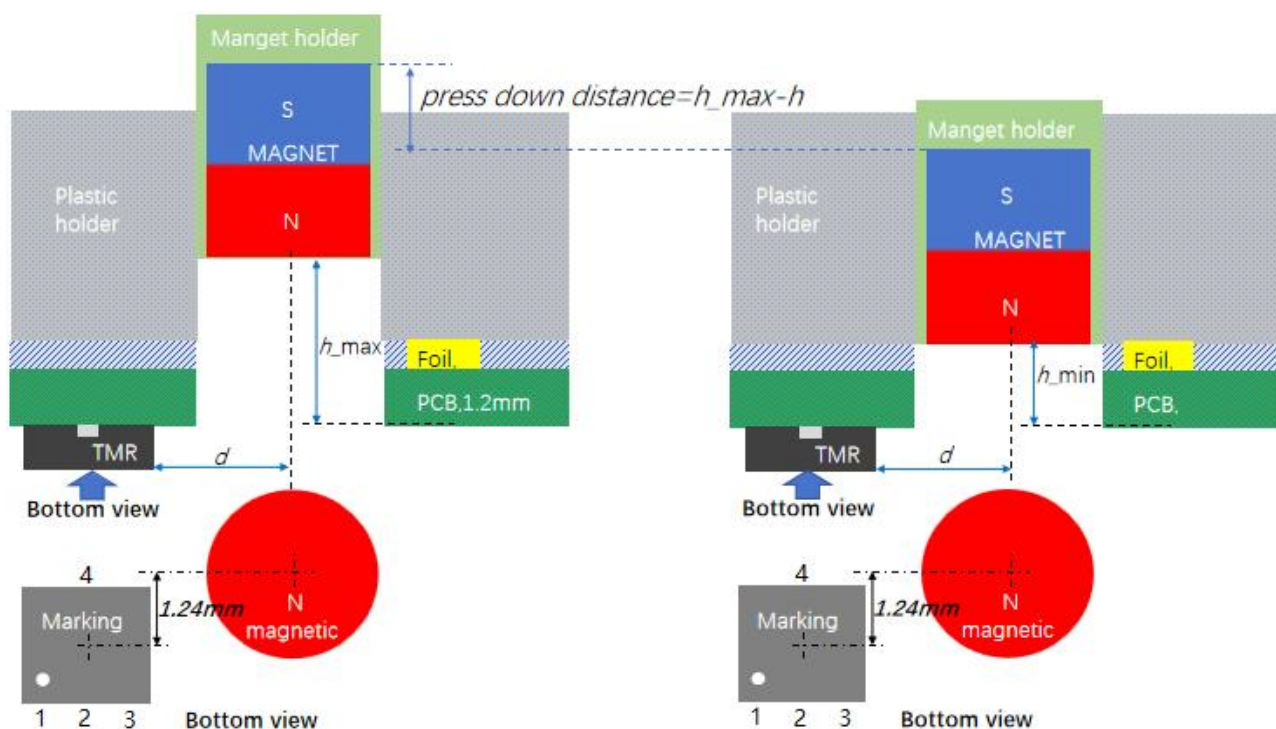
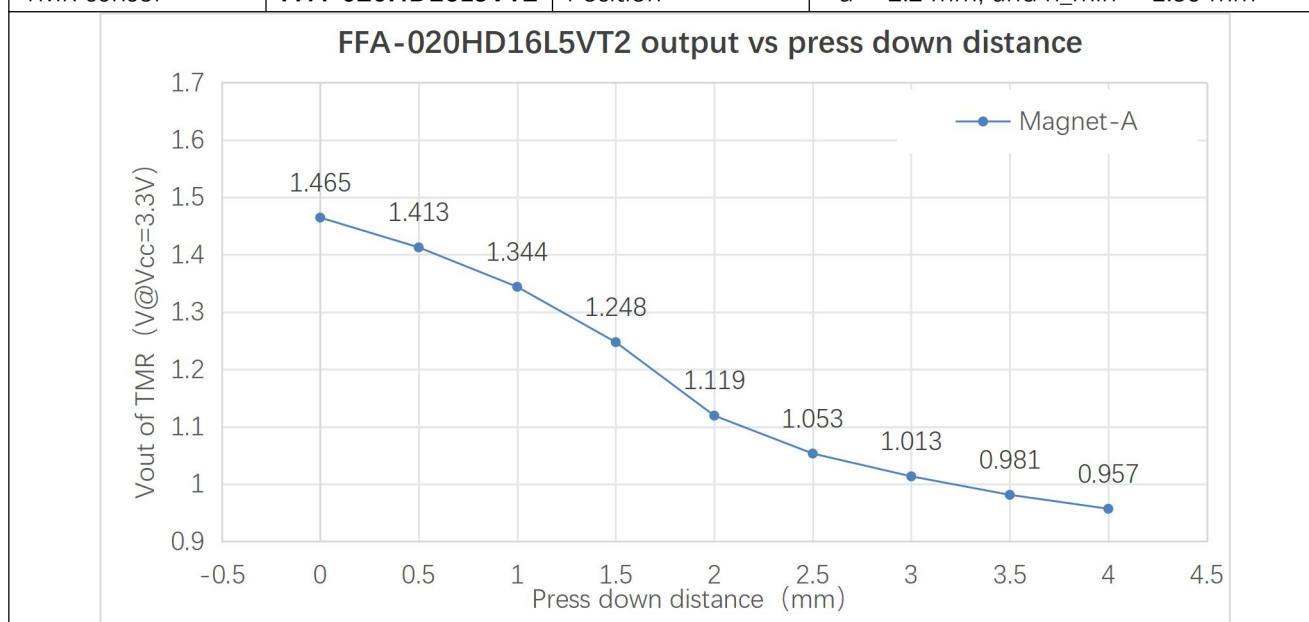


Fig.12 suggested configuration when detecting moving position of small magnet. When the magnet is pressed down, the value of h decreased. ($h_{\max} - h$) is defined as “Press down distance”.

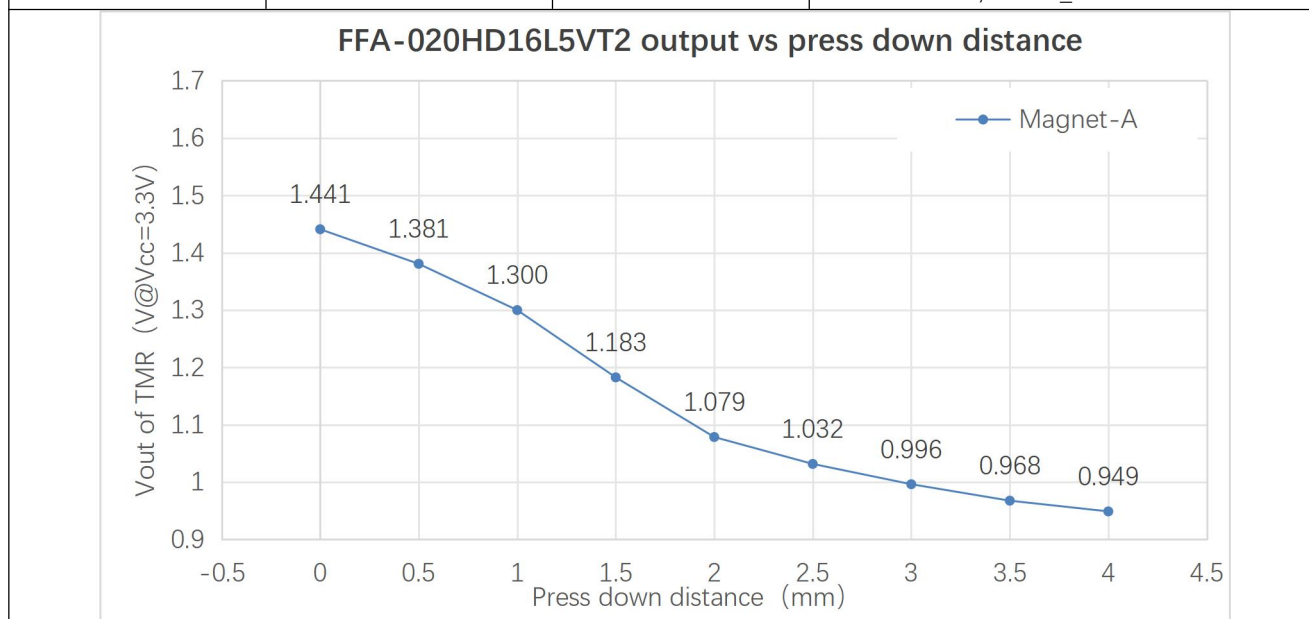
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☆ For application magnets, the following are three typical N-type magnetic potential downward application example, if it is other magnetic pole direction application, please contact us, need to adjust the chip on the PCB board and magnet relative position.

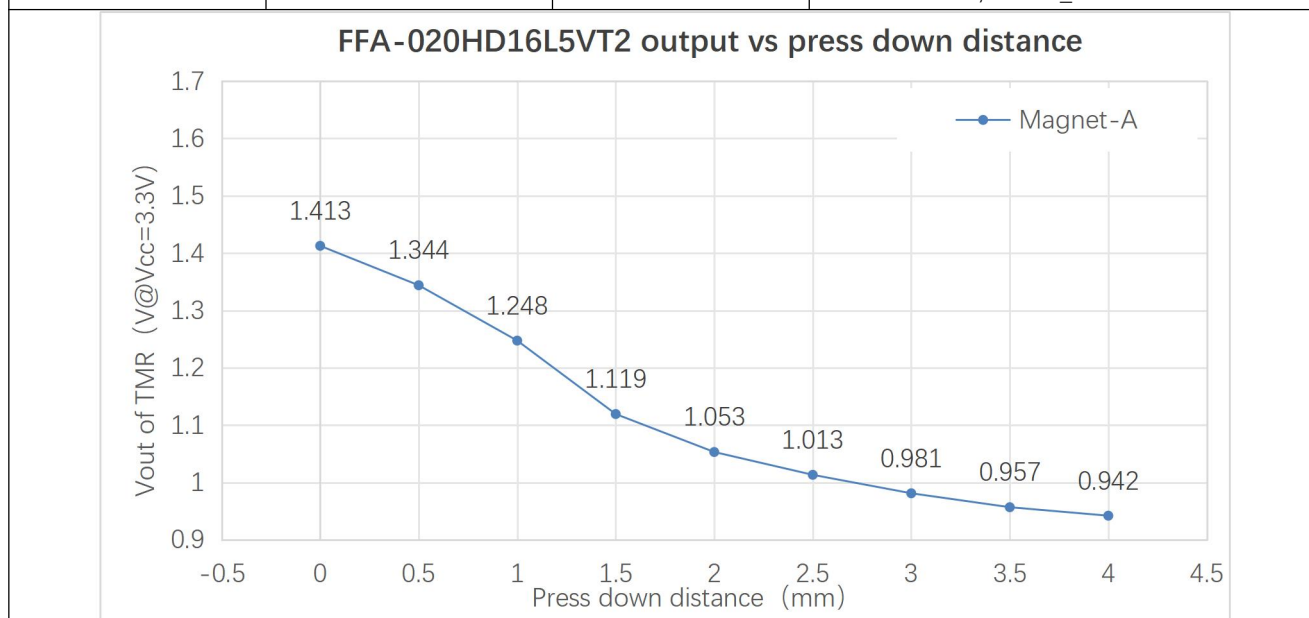
Magnet-A	Diameter	Thickness	Magnetization	Material
	2.8 mm	3.5 mm	Axis direction	NdFeB N52
TMR sensor	FFA-020HD16L5VT2	Position	$d = 2.2 \text{ mm}$, and $h_{\min} = 1.85 \text{ mm}$	



Magnet-A	Diameter	Thickness	Magnetization	Material
	2.8 mm	3.5 mm	Axis direction	NdFeB N52
TMR sensor	FFA-020HD16L5VT2	Position	$d = 2.2 \text{ mm}$, and $h_{\min} = 1.60 \text{ mm}$	



Magnet-A	Diameter	Thickness	Magnetization	Material
	2.8 mm	3.5 mm	Axis direction	NdFeB N52
TMR sensor	FFA-020HD16L5VT2	Position	$d = 2.2 \text{ mm}$, and $h_{\min} = 1.35 \text{ mm}$	



14. Packing

Item	Request	Remark
Reel	7 inch	Fig.13
Carrier width	8 mm	Fig.13
Leader empty length	400 mm	REF: EIA-481
Trailer empty length	160 mm	REF: EIA-481
Quantity of reel	3000pcs/ 7" Reel; 10000pcs/ 13" Reel	Full of tape reel
MSL Level	L3	J-STD-020E

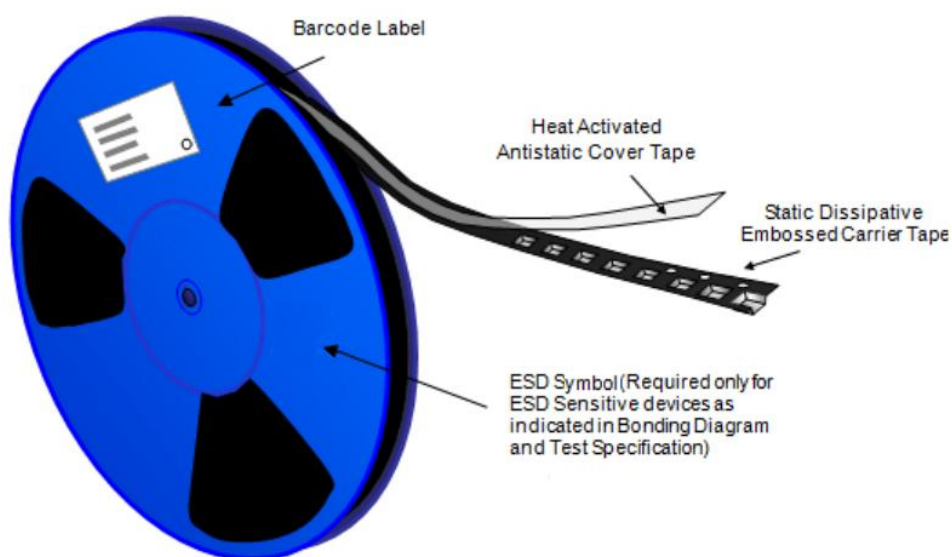


Fig.13 Tape diagram

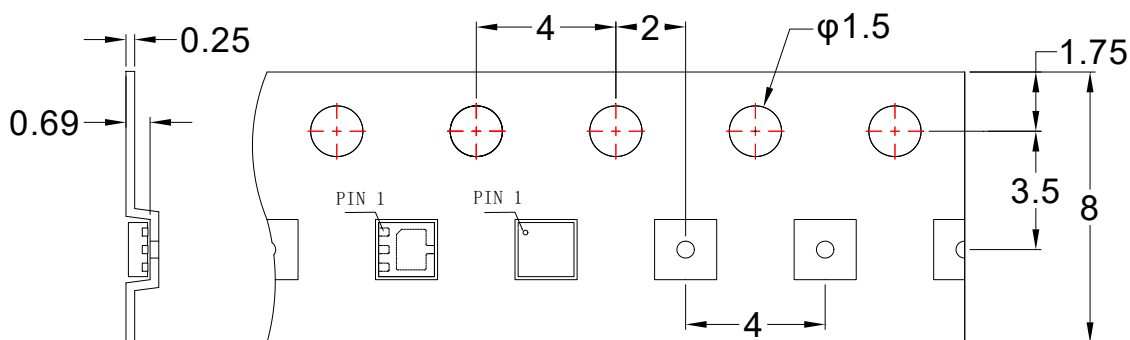


Fig.14 Carrier diagram

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